IN THE CLAIMS

1. (Original) An illumination apparatus comprising:

a small-plane light source having diffusion radiation characteristics;

a columnar light leading member, having an incident end surface, an outgoing radiation end surface and a reflection surface, configured to reflect on the reflection surface at least a part of a light ray from the small-plane light source collected from the incident end surface, thereby leading the light to the outgoing radiation end surface; and

an angle position converting member configured to convert an outgoing light angle intensity of the outgoing light from the outgoing radiation end surface of the columnar light leading member into a position intensity in a predetermined irradiation area.

2. (Original) The apparatus according to claim 1, wherein

the angle position converting member includes a pupil forming member configured to form a pupil by using the outgoing radiation end surface of the columnar light leading member as a virtual light source, and

a position of the irradiation area is set in the vicinity of a position of a pupil formed by the pupil forming member.

3. (Original) The apparatus according to claim 2, wherein

the pupil forming member includes an illumination lens configured to condense the light from the outgoing radiation end surface of the columnar light leading member, and

the predetermined irradiation area is set in the vicinity of a focal position of the illumination lens.

4. (Currently amended) The apparatus according to claim 3, wherein

the apparatus comprises a plurality of the columnar light leading members, and assuming that Y is a length of the outgoing radiation end surface of each columnar light leading member in a given direction of each columnar light leading member, f is a focal distance of the illumination lens, and θ is a maximum allowable light ray angle in the predetermined ~~illumination~~ irradiation area in that direction, an arrangement number n in that direction of the columnar light leading members satisfies the following expression:

$$n \leq (2 \times f \times \mathrm{Tan}\theta) / Y$$

5. (Original) The apparatus according to claim 4, wherein the small-plane light source and the columnar light leading member form a pair.

6. (Currently amended) The apparatus according to claim 4, wherein the columnar light leading members are aligned in such a manner that the outgoing

radiation end surfaces of the columnar light leading members are placed at different positions with respect to a direction of a normal line of the small-plane light source, and the aligned columnar light leading members are arranged in such a manner that ~~the~~ a central columnar light leading member is farthest from the illumination lens and the columnar light leading members positioned at ends are closest ~~from~~ to the illumination lens.

7. (Original) The apparatus according to claim 2, wherein a maximum outgoing radiation NA of the columnar light leading member is configured to substantially match with an incident side NA when forming a pupil with a predetermined size by the pupil forming member.

8. (Original) The apparatus according to claim 2, further comprising a light diffusion element arranged on a rear stage of the outgoing radiation end surface of the columnar light leading member.

9. (Original) The apparatus according to claim 8, wherein, when the pupil forming member has a focal distance f and a size of the irradiation area is L, a diffusion angle θ of the light diffusion element satisfies the following expression:

$$-2 \times \mathrm{Tan}^{-1}(0.5 \times L/f) < \theta < 2 \times \mathrm{Tan}^{-1}(0.5 \times L/f)$$

10. (Original) The apparatus according to claim 8, wherein the light diffusion element includes a one-dimensional diffuser.

11. (Original) The apparatus according to claim 2, wherein the pupil forming member is arranged so as to be eccentric with respect to a normal line of the outgoing radiation end surface of the columnar light leading member.

12. (Original) The apparatus according to claim 11, wherein the pupil forming member includes a prism having free-form surfaces.

13. (Currently amended) The apparatus according to claim 1, wherein the columnar light leading member has a tapered shape such that an area of the outgoing radiation end surface is larger than an area of the incident end surface.

14. (Currently amended) The apparatus according to claim 13, wherein the columnar light leading member has an anisotropy in a ratio of a size of the incident end surface and a size of the outgoing radiation end surface, and

the columnar light leading member is arranged in such a manner that a direction of the ~~large illumination~~ larger area becomes a direction of ~~the~~ a small ratio.

15. (Original) The apparatus according to claim 13, wherein the incident end surface and the outgoing radiation end surface of the columnar light leading member have shapes similar to each other.

16. (Original) The apparatus according to claim 1, wherein the apparatus comprises a plurality of small-plane light sources each having the diffusion radiation characteristics.

17. (Original) The apparatus according to claim 16, wherein the small-plane light source and the columnar light leading member form a pair.

18. (Original) The apparatus according to claim 16, further comprising:

a lighting portion configured to enable adjustment of a light emission quantity of each of the small-plane light sources;

a moving member configured to relatively move the small-plane light sources and the columnar light leading member; and

a light selection controlling portion configured to control at least one of the moving member and the lighting portion so as to select a light ray used to illuminate the illumination area from light rays from the small-plane light sources.

19. (Original) The apparatus according to claim 1, wherein the columnar light leading member includes a rod constituted by an optical plane made of a transparent material.

20. (Original) The apparatus according to claim 1, wherein the columnar light leading member includes a mirror pipe having a hollow structure whose inner surface is constituted by a reflecting mirror.

21. (Currently amended) The apparatus according to claim 1, wherein the columnar light leading member has an anisotropy in a ratio of a size of the incident end surface and a size of the outgoing radiation end surface, and

the columnar light leading member is arranged in such a manner that a direction of ~~the~~ a large illumination area becomes a direction of ~~the~~ a small ratio.

22. (Original) The apparatus according to claim 1, wherein the incident end surface and the outgoing radiation end surface of the columnar light leading member have shapes similar to each other.

23. (Original) The apparatus according to claim 1, further comprising a light flux shape conversion element arranged in the vicinity of the outgoing radiation end surface of the columnar light leading member.

24. (Original) The apparatus according to claim 23, wherein the light flux shape conversion element includes a diffuser which has a function to convert a circular light flux cross-sectional shape into a rectangular shape.

25. (Original) An image projection apparatus comprising:

an illumination apparatus comprising:

a small-plane light source having diffusion radiation characteristics;

a columnar light leading member, having an incident end surface, an outgoing radiation end surface and a reflection surface, configured to reflect on the reflection surface at least a part of a light ray from the small-plane light source collected from the incident end surface, thereby leading the light to the outgoing radiation end surface; and

an angle position converting member configured to convert an outgoing light angle intensity of the outgoing light from the outgoing radiation end surface of the columnar light leading member into a position intensity in a predetermined irradiation area;

a light modulation element, having a pixel structure, configured to modulate a light ray for each pixel in accordance with an image signal; and

a projection lens configured to enlarge and project the light modulation element, wherein

the light modulation element is arranged in the illumination area in the illumination apparatus.

26. The apparatus according to claim 25, wherein

the angle position converting member includes a pupil forming member configured to form a pupil by using the outgoing radiation end surface of the columnar light leading member as a virtual light source, and

a position of the irradiation area is set in the vicinity of a position of a pupil formed by the pupil forming member.

27. (Original) The apparatus according to claim 26, wherein

the pupil forming member includes an illumination lens configured to condense the light from the outgoing radiation end surface of the columnar light leading member, and

the predetermined irradiation area is set in the vicinity of a focal position of the illumination lens.

28. (Currently amended) The apparatus according to claim 27, wherein

the apparatus comprises a plurality of the columnar light leading members, and

assuming that Y is a length of the outgoing radiation end surface of each columnar light leading member in a given direction of each columnar light leading member, f is a focal distance of the illumination lens, and θ is a maximum allowable light ray angle in the predetermined ~~illumination~~ irradiation area in that direction, an arrangement number n in that direction of the columnar light leading members satisfies the following expression:

$$n \leq (2 \times f \times \mathrm{Tan}\theta) / Y$$

29. (Original) The apparatus according to claim 28, wherein the small-plane light source and the columnar light leading member form a pair.

30. (Currently amended) The apparatus according to claim 28, wherein the columnar light leading members are aligned in such a manner that the outgoing radiation end surfaces of the columnar light leading members are placed at different positions with respect to a direction of a normal line of the small-plane light source, and the aligned columnar light leading members are arranged in such a manner that ~~the~~ a central columnar light leading member is farthest from the illumination lens and the columnar light leading members positioned at ends are closest ~~from~~ to the illumination lens.

31. (Original) The apparatus according to claim 26, wherein a maximum outgoing radiation NA of the columnar light leading member is configured to substantially match with an incident side NA when forming a pupil with a predetermined size by the pupil forming member.

32. (Original) The apparatus according to claim 26, further comprising a light diffusion element arranged on a rear stage of the outgoing radiation end surface of the columnar light leading member.

33. (Original) The apparatus according to claim 32, wherein, when the pupil forming member has a focal distance f and a size of the irradiation area is L, a diffusion angle θ of the light diffusion element satisfies the following expression:

$$-2 \times \mathrm{Tan}^{-1}(0.5 \times L/f) < \theta < 2 \times \mathrm{Tan}^{-1}(0.5 \times L/f)$$

34. (Original) The apparatus according to claim 32, wherein the light diffusion element includes a one-dimensional diffuser.

35. (Original) The apparatus according to claim 26, wherein the pupil forming member is arranged so as to be eccentric with respect to a normal line of the outgoing radiation end surface of the columnar light leading member.

36. (Original) The apparatus according to claim 35, wherein the pupil forming member includes a prism having free-form surfaces.

37. (Currently amended) The apparatus according to claim 25, wherein the columnar light leading member has a tapered shape such that an area of the outgoing radiation end surface is larger than an area of the incident end surface.

38. (Currently amended) The apparatus according to claim 37, wherein the columnar light leading member has an anisotropy in a ratio of a size of the incident end surface and a size of the outgoing radiation end surface, and

the columnar light leading member is arranged in such a manner that a direction of the ~~large illumination~~ larger area becomes a direction of ~~the~~ a small ratio.

39. (Original) The apparatus according to claim 37, wherein the incident end surface and the outgoing radiation end surface of the columnar light leading member have shapes similar to each other.

40. (Original) The apparatus according to claim 25, wherein the apparatus comprises a plurality of small-plane light sources each having the diffusion radiation characteristics.

41. (Original) The apparatus according to claim 40, wherein the small-plane light source and the columnar light leading member form a pair.

42. (Original) The apparatus according to claim 40, further comprising:

a lighting portion configured to enable adjustment of a light emission quantity of each of the small-plane light sources;

a moving member configured to relatively move the small-plane light sources and the columnar light leading member; and

a light selection controlling portion configured to control at least one of the moving member and the lighting portion so as to select a light ray used to illuminate the illumination area from light rays from the small-plane light sources.

43. (Original) The apparatus according to claim 25, wherein the columnar light leading member includes a rod constituted by an optical plane made of a transparent material.

44. (Original) The apparatus according to claim 25, wherein the columnar light leading member includes a mirror pipe having a hollow structure whose inner surface is constituted by a reflecting mirror.

45. (Currently amended) The apparatus according to claim 25, wherein the columnar light leading member has an anisotropy in a ratio of a size of the incident end surface and a size of the outgoing radiation end surface, and

the columnar light leading member is arranged in such a manner that a direction of ~~the~~ a large illumination area becomes a direction of ~~the~~ a small ratio.

46. (Original) The apparatus according to claim 25, wherein the incident end surface and the outgoing radiation end surface of the columnar light leading member have shapes similar to each other.

47. (Original) The apparatus according to claim 25, further comprising a light flux shape conversion element arranged in the vicinity of the outgoing radiation end surface of the columnar light leading member.

48. (Original) The apparatus according to claim 47, wherein the light flux shape conversion element includes a diffuser which has a function to convert a circular light flux cross-sectional shape into a rectangular shape.

49. (Original) An illumination apparatus comprising:

a small-plane light source having diffusion radiation characteristics;

columnar light leading means, having an incident end surface, an outgoing radiation end surface and a reflection surface, for reflecting on the reflection surface at least a part of a light ray from the small-plane light source collected from the incident end surface, thereby leading the light to the outgoing radiation end surface; and

angle position converting means for converting an outgoing light angle intensity of the outgoing light from the outgoing radiation end surface of the columnar light leading means into a position intensity in a predetermined irradiation area.

50. (Original) An image projection apparatus comprising:

an illumination apparatus comprising:

a small-plane light source having diffusion radiation characteristics;

columnar light leading means, having an incident end surface, an outgoing radiation end surface and a reflection surface, for reflecting on the reflection surface at least a part of a light ray from the small-plane light source collected from the incident end surface, thereby leading the light to the outgoing radiation end surface; and

angle position converting means for converting an outgoing light angle intensity of the outgoing light from the outgoing radiation end surface of the

columnar light leading means into a position intensity in a predetermined irradiation area;

a light modulation element, having a pixel structure, for modulating a light ray for each pixel in accordance with an image signal; and

a projection lens for enlarging and projecting the light modulation element, wherein

the light modulation element is arranged in the illumination area in the illumination apparatus.